Stoller
Grand Junction Office established 1959

DOE-EM/GJ1203-2006

399-3-20 (C5002)
Log Data Report

Borehole Information:

Borehole:	399-3-20 (C5002)		Site:	East of 307 Disposal Trenches (WIDS Site 316-3	
Coordinates (WA St Plane)		GWL[1] (ft) :	49 (approximate)	GWL Date:	05/16/06
North (m)	East (m)	Drill Date	TOC Elevation (ft)	Total Depth (ft)	Type
not available	not available	05/01/06	not available	90	Sonic

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded Carbon Steel	4.5	9 3/4	8 5/8	9/16	4.5	90

Borehole Notes:

The logging engineer measured the 8-in. casing and stickup using a steel tape. Measurements were rounded to the nearest 1/16 in. The onsite geologist reported the depth to bottom and depth to groundwater.

Logging Equipment Information:

Logging System:	Gamma 4N	Type:	SGLS (60%) SN: 45TP22010A
Calibration Date:	04/06/06	Calibration Reference:	DOE-EM/GJ1177-2006
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Logging System:	Gamma 4H	Type:	NMLS SN: H310700352
Calibration Date:	03/06/06	Calibration Reference:	DOE-EM/GJ1154-2006
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3 Repeat	4 Repeat	
Date	05/16/06	05/16/06	05/17/06	05/17/06	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	0.0	66.0	85.0	50.0	
Finish Depth (ft)	65.5	87.0	78.0	42.0	
Count Time (sec)	200	200	400	400	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	0.5	0.5	0.5	0.5	

Log Run	1	2	3 Repeat	4 Repeat	
ft/min	N/A[2]	N/A	N/A	N/A	
Pre-Verification	DN311CAB	DN311CAB	DN311CAB	DN311CAB	
Start File	DN311000	DN311133	DN311175	DN311190	
Finish File	DN311132	DN311174	DN311189	DN311206	
Post-Verification	DN311CAA	DN311CAA	DN311CAA	DN311CAA	
Depth Return Error (in.)	0	N/A	N/A	N/A	
Comments	Fine gain adjustment after files-020, -50, and -083.	No fine gain adjustments.	No fine gain adjustments.	No fine gain adjustments.	

Neutron Moisture Logging System (NMLS) Log Run Information:

Log Run	5	6 Repeat			
Date	05/01/06	05/01/06			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	0.0	42.0			
Finish Depth (ft)	47.75	47.75			
Count Time (sec)	15	15			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	0.25	0.25			
ft/min	N/A	N/A			
Pre-Verification	DH052CAB	DH052CAB			
Start File	DH052000	DH052192			
Finish File	DH052191	DH052215			
Post-Verification	DH052CAA	DH052CAA			
Depth Return Error (in.)	N/A	0			
Comments	No fine gain adjustment	No fine gain adjustment			

Logging Operation Notes:

Logging was conducted with a centralizer on the sondes. Logging data acquisition is referenced to ground level. The maximum logging depth achieved was 87.2 ft. Repeat sections were collected in this borehole to evaluate each system's performance and to acquire more detailed information at selected depths. The SGLS repeat sections were acquired at 400 second counting time relative to 200 seconds for the main log.

Analysis Notes:

Analyst:	Henwood	Date:	05/18/06	Reference:	GJO-HGLP 1.6.3, Rev. 0

Pre-run and post-run verifications for the SGLS (G4N) were acquired in the Amersham verifier, serial number 115 which is enhanced in the naturally occurring radionuclides ^{40}K, ^{238}U, and ^{232}Th (KUT). The verification criteria were met.

A casing correction for 9/16-in.-thick casing was applied to the SGLS log data.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL worksheet template identified as G4NApr06.xls using efficiency functions and corrections for casing, water, and dead time as determined from annual calibrations. No correction for dead time was necessary. A correction for water was applied to data acquired below 49 ft in depth.

The NMLS data are presented as counts per second. A calibration for casing inside diameters greater than 8-in. is not available.

Results and Interpretations:

A plot of manmade radionuclides is included for ^{137}Cs and processed uranium (^{235}U and ^{238}U). The plot indicates all detections based on the routine processing software. All of the detections were at or near the respective MDLs. Inspection of each spectrum where a detection was indicated revealed no full energy peaks. Therefore, the detections are considered to be statistical fluctuations and are not considered valid. No other manmade radionuclides were indicated.

There is a strong indication of radon in the groundwater. Comparison of the 1764 keV and 609 keV ^{214}Bi gamma rays show differing concentrations after corrections for water and casing. The casing and water correction factors decrease with increasing energy. Gamma rays originating inside the casing are not attenuated by the steel casing, and the net effect of applying the correction factors is to amplify results from low-energy gamma rays. The fact that the 609 keV gamma ray results in a higher apparent concentration than the 1764 keV gamma line suggests that radon is present in the groundwater. Typical formation concentrations of naturally occurring ^{238}U are between approximately 0.5 and 1.5 pCi/g. The concentrations above the groundwater level are consistent with these values for the assays of both the 609 and 1764 keV peaks. Note that enhanced radon is not related to the existence of manmade uranium.

The neutron moisture results are reported in counts per second because no valid calibration is available for borehole inside diameters greater than 8 inches. Some variation is noted in the moisture profile.

The repeat sections generally indicate good agreement of the naturally occurring KUT and moisture. No manmade radionuclides were detected at the 400 second counting time.

Log Plots:

Manmade Radionuclides
Natural Gamma Logs
Combination Plot
Total Gamma & Moisture
Total Gamma & Dead Time
Repeat Section of Natural Gamma Logs (42-50 ft)
Repeat Section of Natural Gamma Logs (78-85 ft)
Moisture Repeat Section

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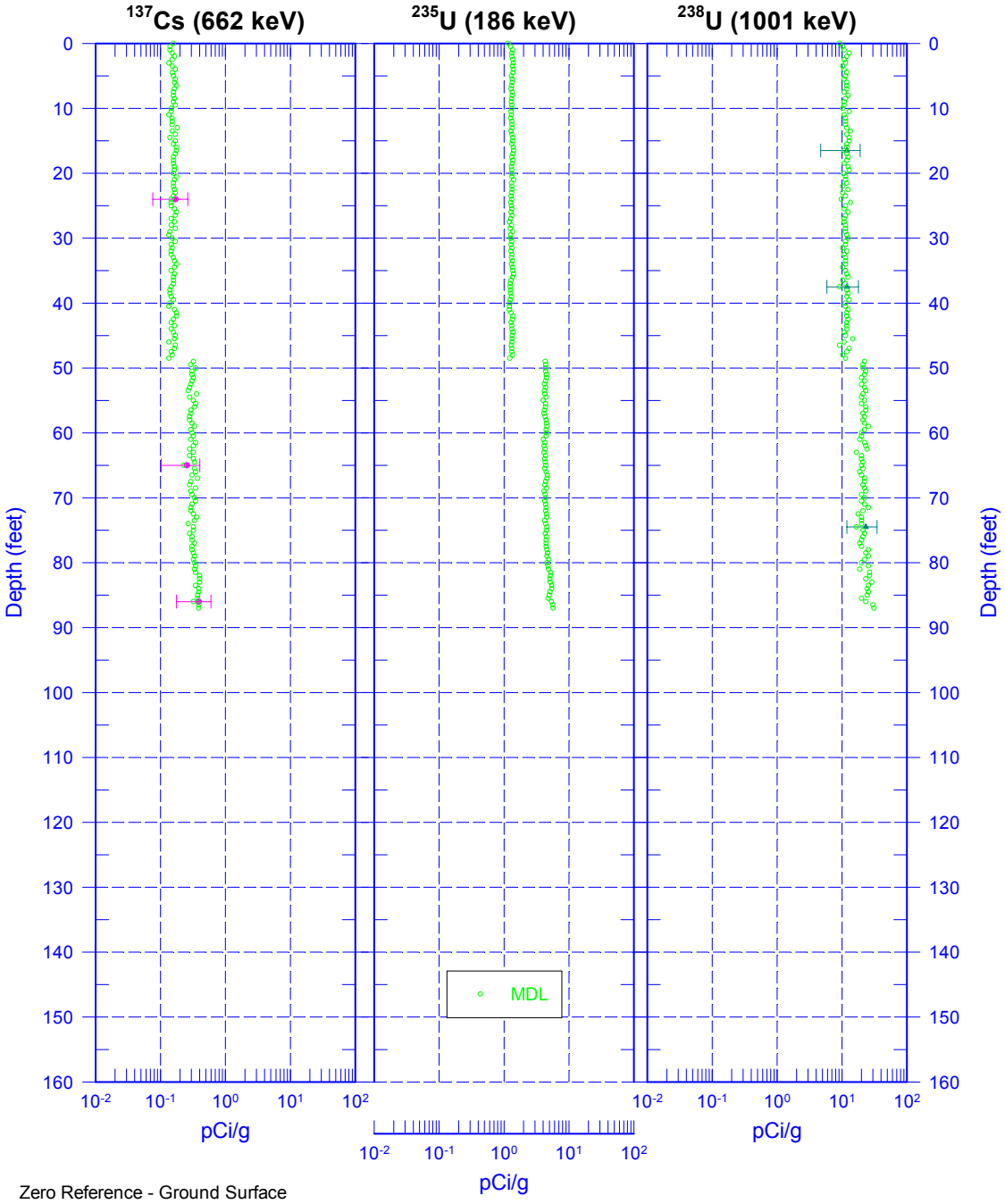
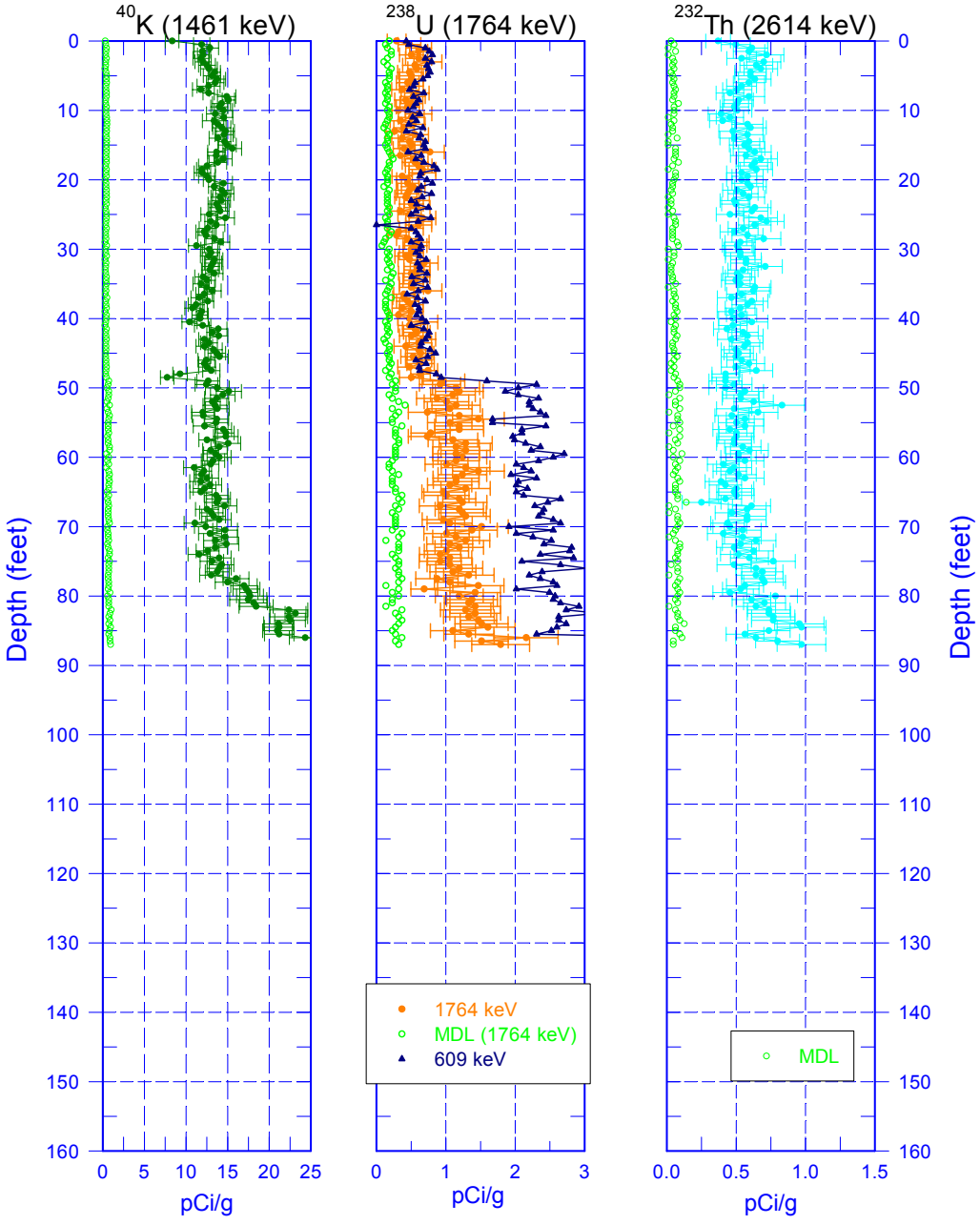
[1] GWL – groundwater level
[2] N/A – not applicable

399-3-20 (C5002)
Manmade Radionuclides

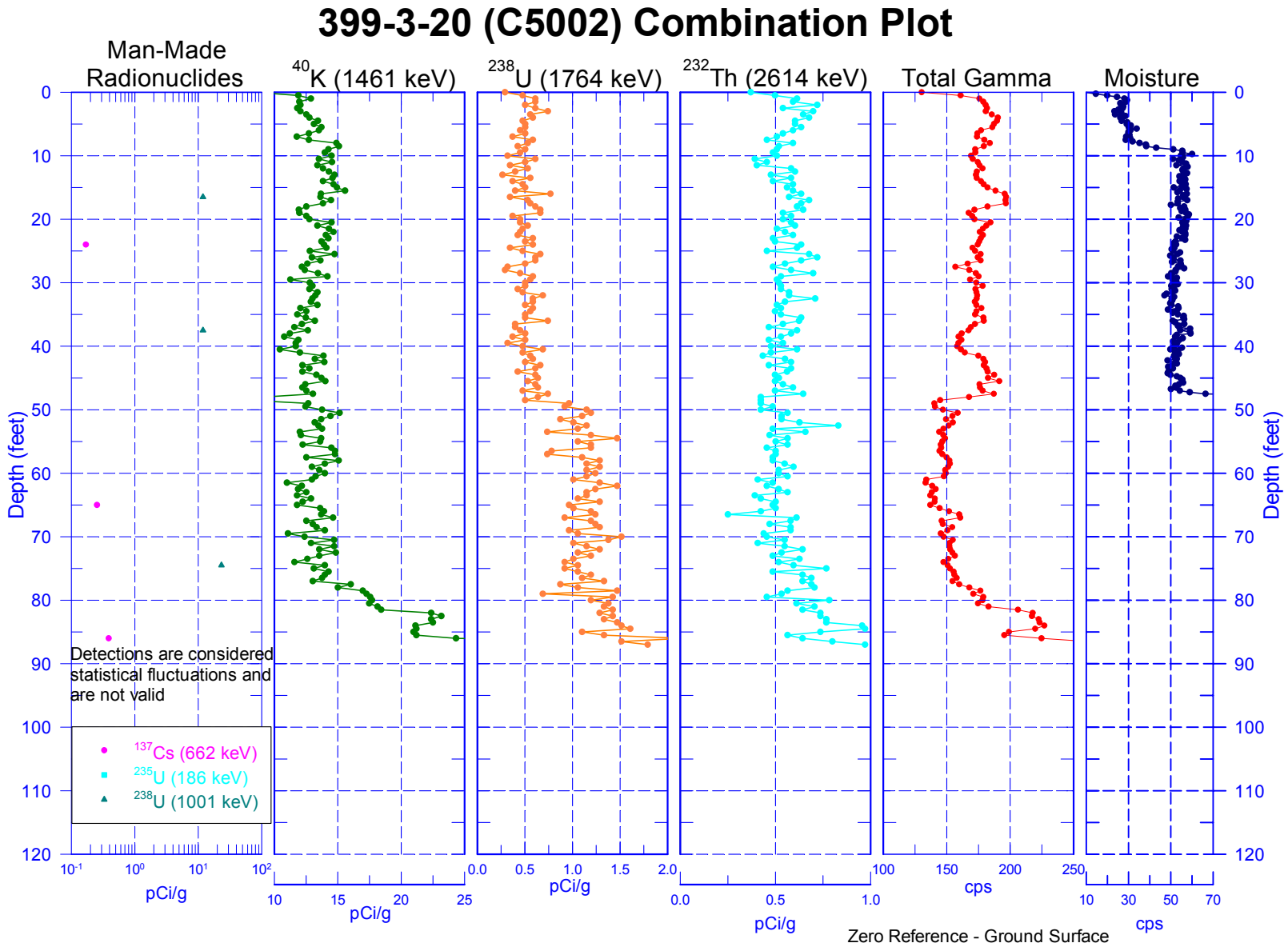


Zero Reference - Ground Surface

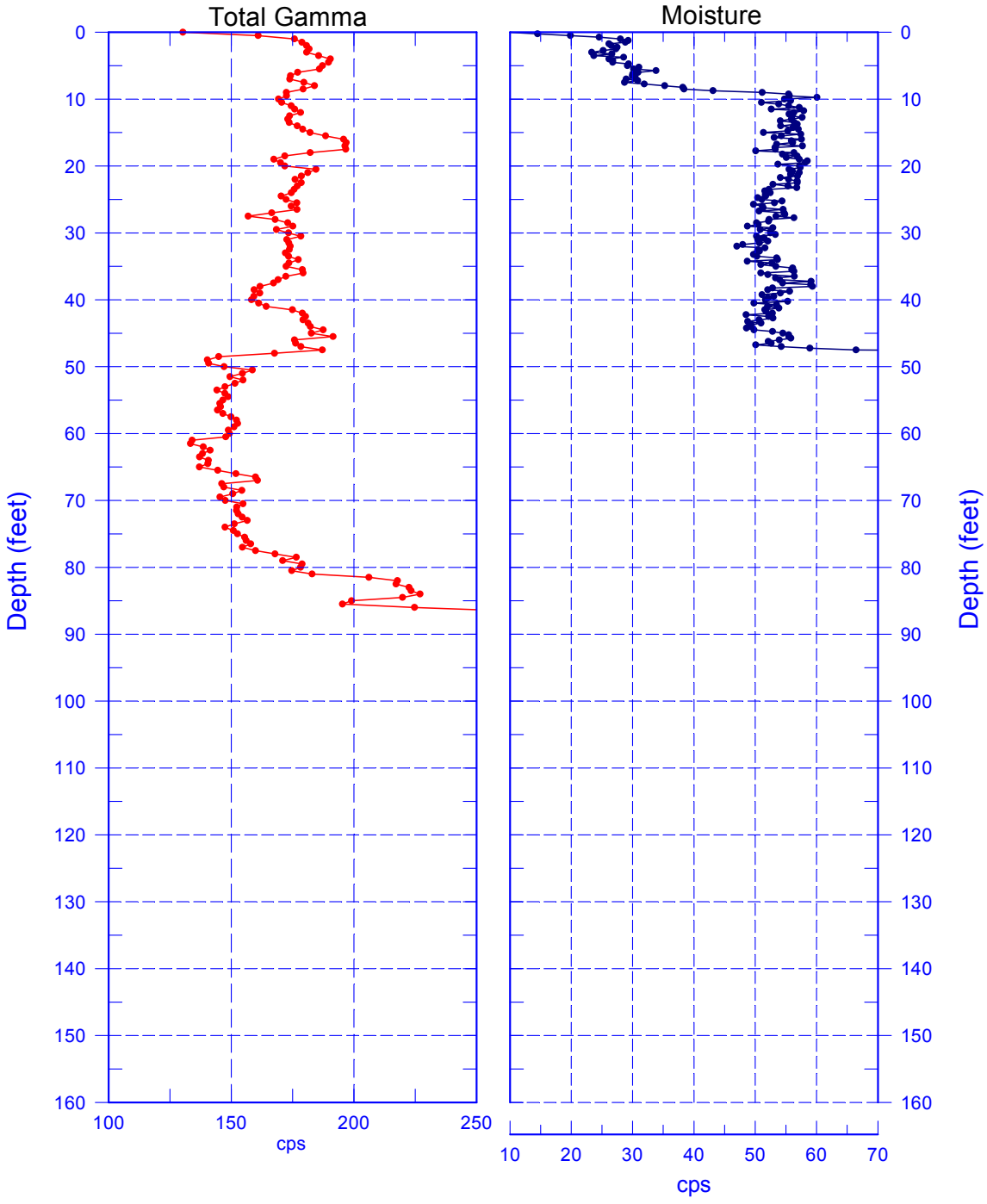
399-3-20 (C5002)
Natural Gamma Logs



Zero Reference - Ground Surface

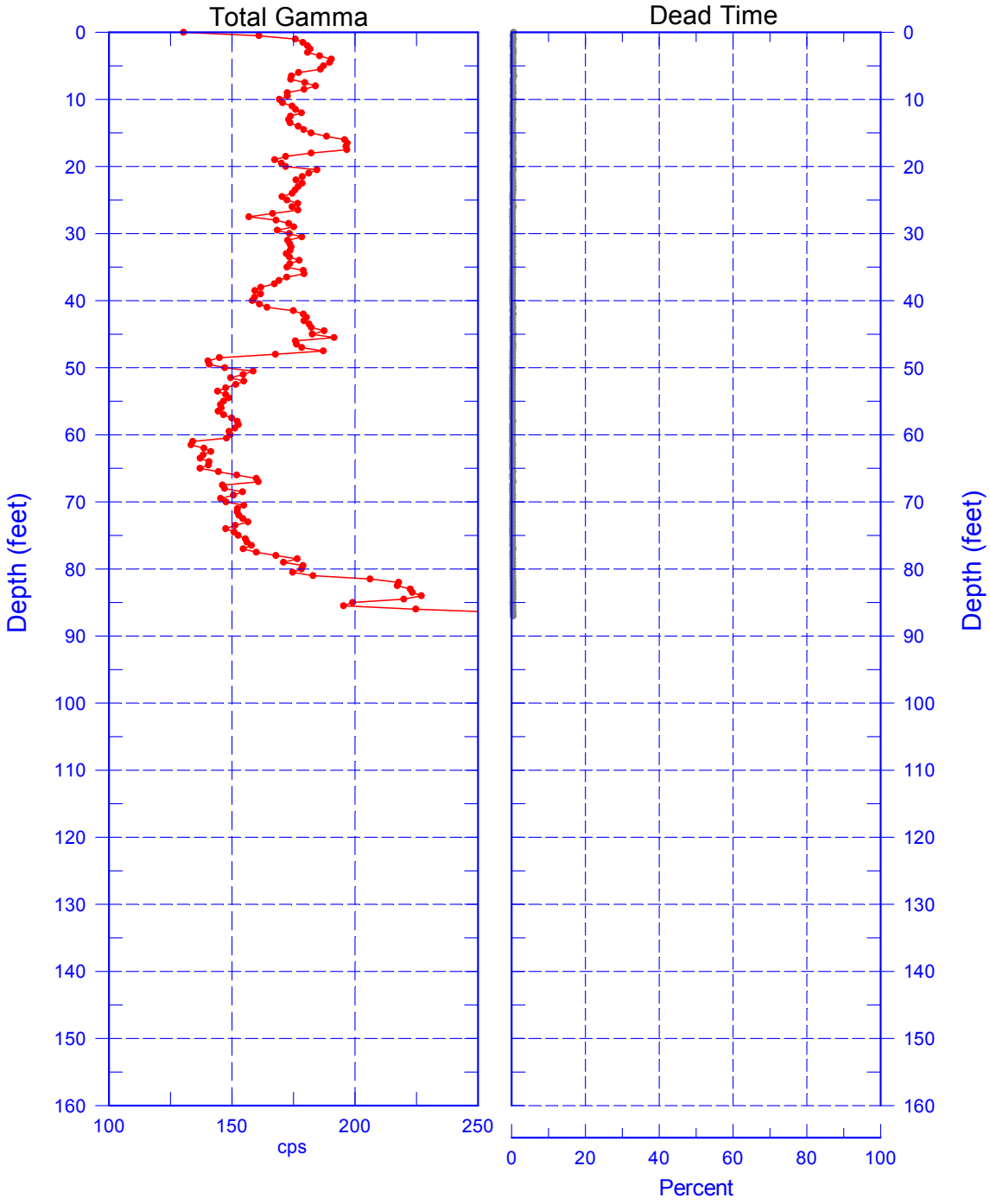

399-3-20 (C5002) Combination Plot
Man-Made Radionuclides
40K (1461 keV)
238U (1764 keV)
232Th (2614 keV)
Total Gamma
Moisture
Depth (feet)
Detections are considered statistical fluctuations and are not valid
137Cs (662 keV)
235U (186 keV)
238U (1001 keV)
pCi/g
cps
Zero Reference - Ground Surface

399-3-20 (C5002)
Total Gamma & Moisture



Reference - Ground Surface

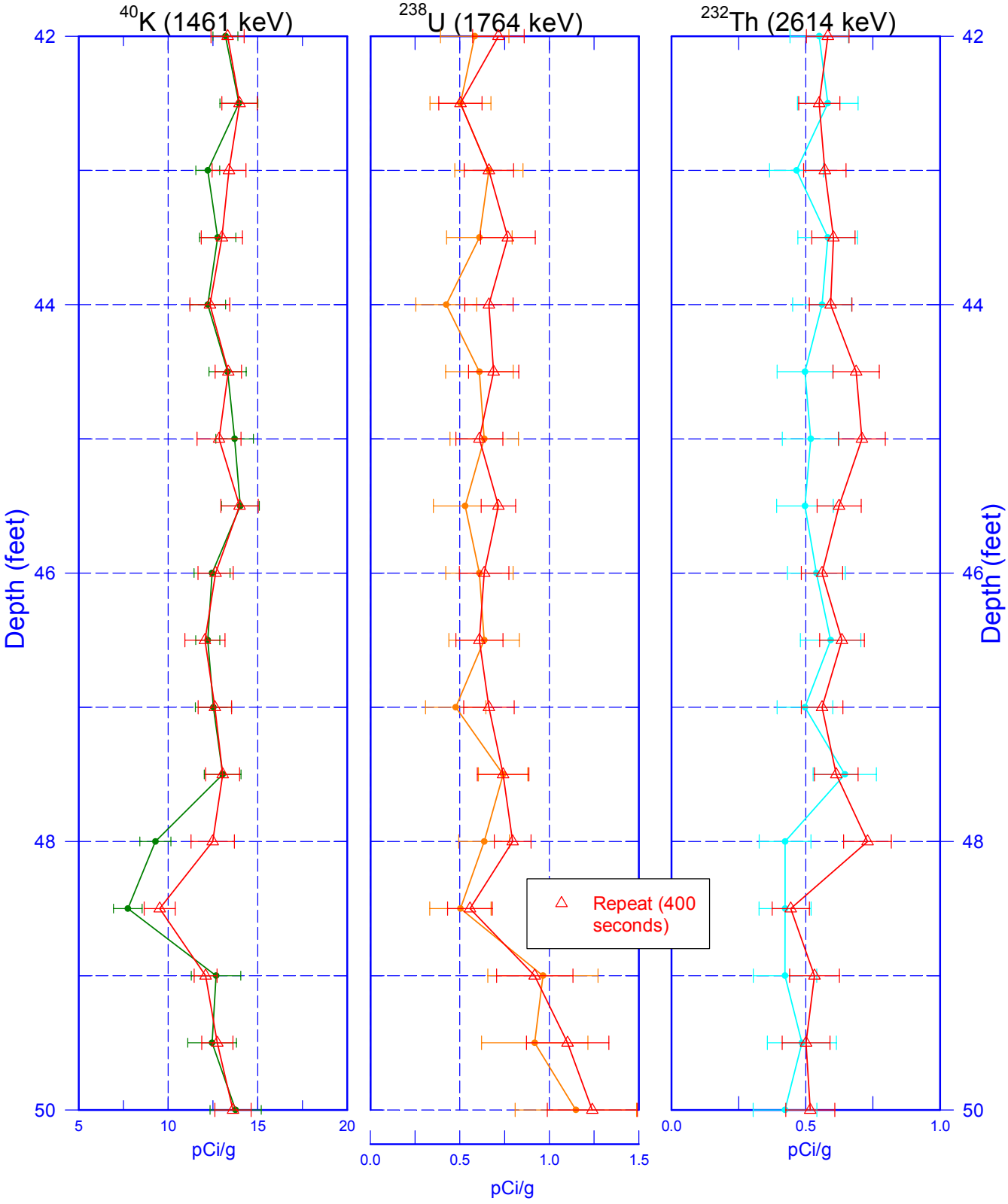
399-3-20 (C5002)
Total Gamma & Dead Time



Reference - Ground Surface

399-3-20 (C5002)

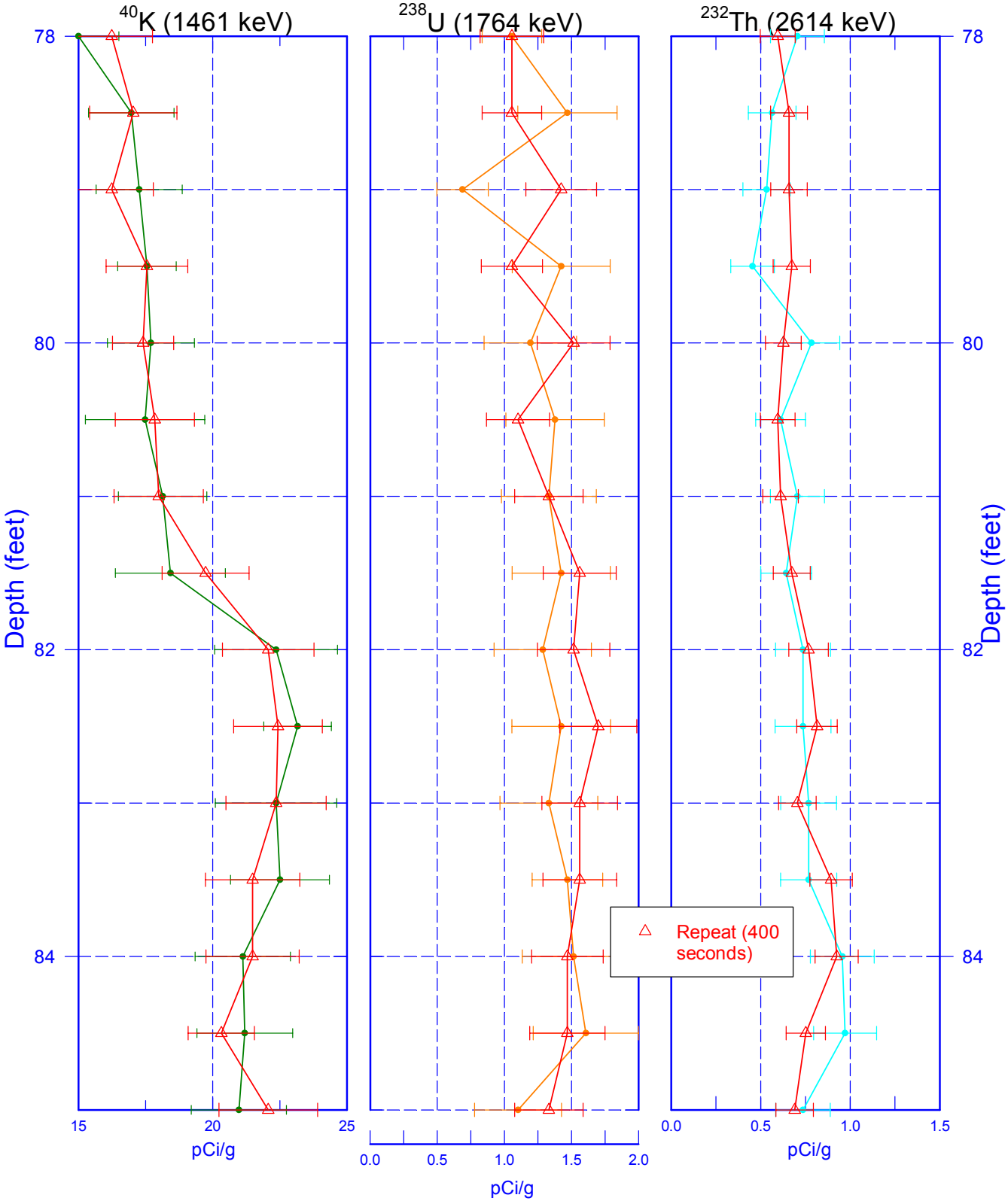
Repeat Section of Natural Gamma Logs



Zero Reference - Ground Surface

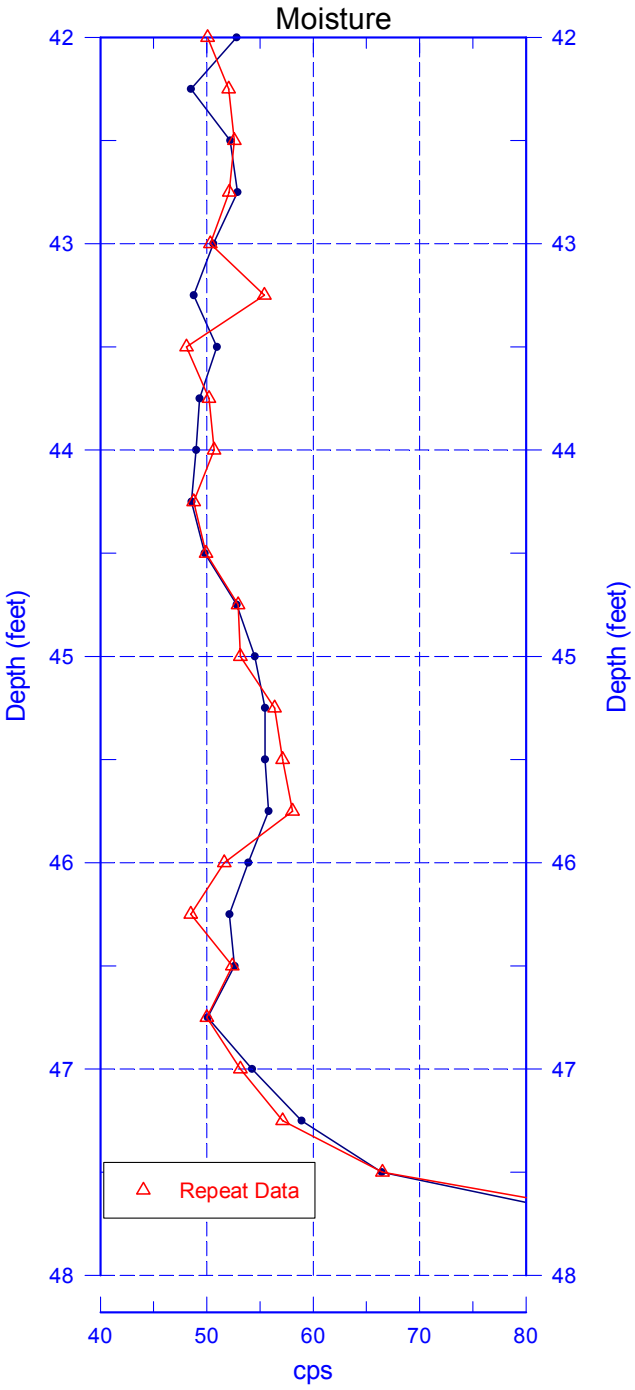
399-3-20 (C5002)

Repeat Section of Natural Gamma Logs



Zero Reference - Ground Surface

399-3-20 (C5002)
Moisture Repeat Section



Reference - Ground Surface